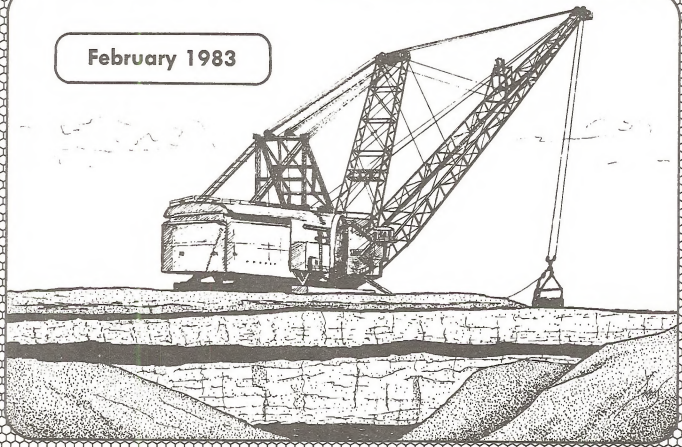
BLM LIBRARY
88011216

NORTHERN POWDER RIVER TRACT PROFILE

WOLF MOUNTAIN MAINTENANCE

February 1983



UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Miles City District Office
Miles City, Montana

Resources Evaluation
Billings, Montana

TN
291
.P8S7

Bureau of Land Management
Library
Bldg. 50, Denver Federal Center
Denver, CO 80225

#9420674

8801316

TN
291
.P887

POWDER RIVER RESOURCE AREA TRACT PROFILE
WOLF MOUNTAIN MAINTENANCE

PART I: SITE-SPECIFIC ANALYSIS OF THE WOLF MOUNTAIN MAINTENANCE COAL LEASE TRACT

By Bureau of Land Management

PART II: TRACT SUMMARY REPORT, WOLF MOUNTAIN MAINTENANCE

By Resource Evaluation

Bureau of Land Management
Library
Bldg. 50, Denver Federal Center
Denver, CO 80225

CONTENTS

PART I

DESCRIPTION OF THE PROPOSED ACTION 1
CHAPTER I — AFFECTED ENVIRONMENT 3
- Geology and Topography 3
- Soils 3
- Water Resources 4
- Vegetation 5
- Agriculture 5
- Ownership and Land Use 5
- Wildlife 5
- Cultural Resources 7
- Recreation 7
- Visual Resources Management 7
- Climate and Air Quality 7
- Noise 8
- Transportation Facilities 8
- Socioeconomics 8

CHAPTER II — ENVIRONMENTAL CONSEQUENCES 11
- Geology and Topography 11
- Soils 11
- Water Resources 11
- Vegetation 13
- Agriculture 13
- Ownership and Land Use 14
- Wildlife 14
- Cultural Resources 14
- Recreation 14
- Visual Resources Management 14
- Climate and Air Quality 14
- Noise 15
- Transportation Facilities 15
- Socioeconomics 16
- Net Energy Analysis 16

REFERENCES 19
APPENDICES 21

PART II

Tract Description 33
Entities Expressing Interest 34
Coal Resource Class Designation 34
Coal Geology 38
Potential Use of Coal 38
Transportation 39
Mineability 39
Marketability 39
Attachments 41

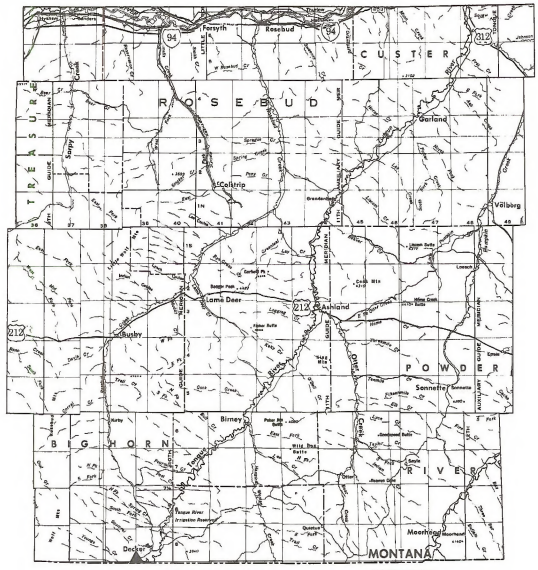
UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

PART I

Site-Specific Analysis
Wolf Mountain Maintenance Coal Lease Tract
Big Horn County, Montana

Miles City District Office
Miles City, Montana

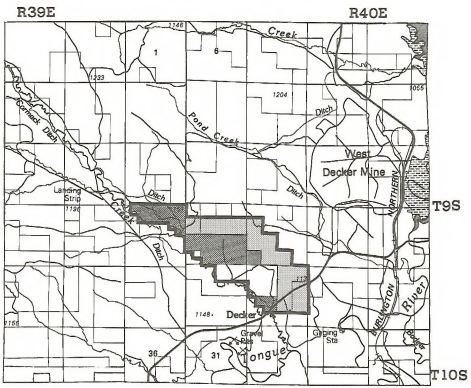
February 1983



1 0 1 2 3 4
Scale in Miles

▲ Tract

WOLF MOUNTAIN
LOCATION MAP



WOLF MOUNTAIN MAINTENANCE

- Meets BLM Further Consideration for Coal Leasing Requirements
- Existing Federal Coal Lease
- Tract Boundary

DESCRIPTION OF THE PROPOSED ACTION

The proposed action is to offer for lease a 598-acre tract of land in southeastern Big Horn County, Montana. This tract contains approximately 30.87 million tons of recoverable coal immediately adjacent to 524 acres of leased federal coal and 249 acres of leased private (fee) coal. Leasing would prevent a bypass situation and maximize resource recovery within the proposed Wolf Mountain mine. The tract is located adjacent to Decker, Montana, and 20 miles northeast of Sheridan, Wyoming. The maps preceding this page show the general location of the tract. Attachment A to Part II gives a legal description of the tract.

In preparing to offer this tract, personnel from the BLM, Miles City District, inventoried to determine the site specific resource values and analyzed the potential environmental effects of coal development on this individual tract. Previous planning included application of surface owner consultation, multiple use and unsuitability criteria (43 CFR 3461). Any new findings of unsuitability are reflected in the delineation and development proposal of the tract described in this profile.

The tract contains, in place, 82.31 million tons of federal coal. Of this, 30.87 million tons are assumed to be recoverable. The remaining 51.44 million tons is not considered to be economically recoverable, because of overburden and/or coal quality. Annual production from the mining unit would be 3.0 million tons. This would increase the life span of the Wolf Mountain mine from 17 years to 26 years. There would be no change in construction and production employment levels experienced from the development of the proposed Wolf Mountain mine.

Surface disturbance would be about 10 acres per year for the uncommitted federal minerals and about 26 acres per year for the total tract. Additional surface may be disturbed during reclamation operations. More specific information on the proposed mining operation is available in Part II, "Tract Summary Report," prepared by BLM Resources Evaluation.

The Wolf Mountain mine is currently in the permitting process of the Office of Surface Mining and the Montana Department of State Lands. An Environmental Impact Statement is being written to address the impacts of the proposed mining operations.

It is assumed that proper mining and reclamation would be carried out according to existing state and federal regulations. These include: Office of Surface Mining Reclamation and Enforcement (30 CFR 700-899); Environmental Protection Agency (40 CFR 0-399); Department of the Interior's coal management program regulations (30 CFR 211, 43 CFR 23, and 43 CFR 3400); and the regulations of the Montana Department of State Lands.

CHAPTER I
AFFECTED ENVIRONMENT

GEOLOGY AND TOPOGRAPHY

Geology

Rock exposures are all within the Paleocene Tongue River Member of the Fort Union Formation. These rocks consist primarily of sandstones and siltstones with some shales. The regional dip is about one degree southeasterly. Several northeast trending faults are present. Fault throws range up to 240 feet. Many of the faults have been rotated, forming a complicated geologic structure.

The exposed Smith seam averages 12 feet in thickness. It ranks as subbituminous C, with 8,500 BTUs per pound. Ash and sulfur contents are 6.27% and 0.70%, respectively. The seam covers about 160 acres within the tract and is about 300 feet above the Anderson.

The large economical coal seams in descending order are the Anderson, Dietz 1 and Dietz 2. The stratigraphy of these three coal seams is somewhat complex. In some locations all three seams have converged, while in other areas there may be a combination of two seams and a split seam or all three seams may be separate. The most common configuration in the tract is a combined Anderson, Dietz 1 and Dietz 2.

Individual seam thicknesses range from 18 to 32 feet, where two of three seams are combined, the average thickness is 70 to 72 feet. Where all three seams have converged, the average thickness is 80 feet. These three seams account for an estimated 77 million tons of uncommitted federal coal. The Anderson, Dietz 1 and Dietz 2 coals all rank subbituminous C, with from 9,500 to 9,700 BTUs per pound. The ash and sulfur contents range from 4.02 to 4.82% and 0.25 to 0.37% respectively. A total of 84% or 65 million tons of federal uncommitted coal is present as the combined Anderson-Dietz 1 and the separate Dietz 2 seams. Overburden above the Anderson ranges from 195 to 540 feet.

About 40 acres of Smith scoria are present within the tract. No other scoria is present.

If any gravel deposits are present, they are small and not of much significance. Other than possible gravel and the Smith scoria, no other saleable minerals are present.

Other than coal, the only other potential leasable mineral is oil and gas. Within five miles from the tract boundary, approximately 11 oil and gas wells have been drilled. Three had gas shows, but not in economic quantities. All holes have been plugged and abandoned. One of these 11 wells was drilled within the tract boundary.

There are no known valuable, locatable mineral deposits within the tract.

Paleontological material is probably insignificant. Possibly present are leaf impressions, some freshwater shells, and some petrified wood. No known valuable paleontological material lies within the tract.

Topography

The tract elevations range from a Squirrel Creek low of 3,520 feet to a hilltop high of 3,875 feet above sea level.

The terrain consists of two distinct areas. The southwest half is within the main Squirrel Creek valley. The northeast half consists of the basal portions and hill masses along the northeast side of Squirrel Creek.

Almost all the tract lies northeast of Squirrel Creek and most side coulees flow to the southwest. Except for one side coulee, the remaining coulees are a mile or less in length.

SOILS

Soils are composed of deep clayey types (Heldt, Hydro) on nearly level to gently sloping (0-4%) fans and terrances and deep loamy soils (Fort Collins and McRae) on moderately sloping (4-8%) fans and terraces; moderately deep loamy soils (Thedalund) on strongly sloping (8-15%) sideslopes and hills; and shallow soils (Midway) and shale outcrops on steep to very steep (25-45%) dissected clay shale highlands.

Many mapping units throughout the tract occur as complex, variable patterns of deep, moderately deep and shallow soils, some of which include rock outcrops.

The soils data is from the Big Horn County published soil survey.

WATER RESOURCES

Groundwater

Groundwater in the Wolf Mountain Maintenance tract is found in three aquifers: Squirrel Creek alluvium, the Tongue River Member clastic rocks, and the shallow Tongue River Member coal beds.

The Squirrel Creek valley contains up to 60 feet of alluvial material. Groundwater has saturated most of the alluvium below stream level. Alluvial groundwater quality precludes domestic use without treatment, although it is suitable for stock and marginally suitable for irrigation use.

Tongue River Member clastic rocks, because of their lateral and vertical discontinuity, are of limited worth as aquifers. Yields from wells in clastic siltstones and fine-grained sandstones are generally less than a few gallons per minute and normally have low water quality.

Anderson and Dietz coal seams yield significant quantities of potable water and are the most important aquifers in the area. Wells penetrating these coal beds provide domestic and stock water. Yields from wells penetrating coal beds are generally less than 10 gallons per minute.

Clinker is present in topographically high areas and is directly involved with recharge. Clinker is rarely saturated with water. As an aquifer, clinker acts similarly to alluvium with hydraulic conductivities around 120 feet per day (ft/day). Storage coefficients for alluvium in this tract are around 0.0002 to 0.0023; for clinker, though, they are around 0.02 to 0.34.

Coal wells produce hydraulic conductivities from 0.1 ft/day to 8.1 ft/day and transmissivities from about three square feet per day (ft^2/day) to almost 500 ft^2/day.

Direction of groundwater flow in the coal beds is strongly controlled by northeast trending faults that act as barriers to groundwater movement. If not for the faults, the preferred direction of flow would be parallel to the regional structural dip or southeastward. This tract lies within the central fault block, described by Van Voast (1981) as connecting the recharge along Youngs Creek to the existing Decker mine.

Depth to water below land surface for alluvial wells is anywhere from 2.4 feet to almost 30 feet. Depth to water in coal wells varies from a few feet to almost 250 feet.

Total dissolved-solids (TDS) concentrations for alluvial water range from 1,342 to 6,060 milligrams per liter (mg/l), principal constituents being magnesium, sodium, and sulfate. TDS concentrations of coal waters range from 686 to 2,851 mg/l and average about 1,610 mg/l. High sodium concentrations of coal aquifer water render it usually unsuitable for irrigation. Even though coal water exceeds recommended standards for drinking water, it is used regularly for domestic and livestock supplies by area residents.

Only one well has been identified inside the tract, but 24 wells have been identified within a 2-mile radius of the tract boundary (Levings 1981). One of the off-site wells is on public land. Several other observation wells exist in this area.

Surface Water

Squirrel Creek flows in a channel that closely follows and occasionally meanders within the southwestern boundary of this tract. Squirrel Creek is a perennial stream and its southwestward flowing ephemeral tributaries intercept and carry the bulk of surface runoff from this tract.

Squirrel Creek is closely connected with the alluvium. Within this tract, Squirrel Creek is a gaining stream, indicating that its flow increases through the tract as alluvial water is added to it. This ground water contribution increases the TDS content to almost four times the amount present in upstream reaches. The lower quality alluvial water is no doubt strongly influenced by the irrigation return flows that closely correlate with the area of increased TDS concentrations (Kiewit Mining Co. 1982).

Squirrel Creek discharge is greater than or equal to 0.5 cubic feet per second (cfs) 90% of the time. Its flow is greater than 15 cfs 10% of the time and its median flow is about 1.9 cfs. There is 68% confidence that the 10-year peak discharge at its mouth will be between 220 and 1,000 cfs. Average-annual runoff for the Squirrel Creek drainage is estimated to be 3.96 inches, which is higher than for other comparable drainages in this area.

Dissolved-solids concentrations of water in Squirrel Creek upstream from this tract are usually in the range of 584-950 mg/l, which is probably fairly characteristic of ephemeral stream and stock pond water. Dissolved-solids concentrations of water flowing adjacent to this tract in Squirrel Creek is in the range of 1,970 to 3,844 mg/l. Elevated TDS concentrations consist mostly of increases in sodium, magnesium, and sulfate, but chloride and nitrates are

also significantly increased. Lead concentrations exceed U.S. Public Health Service mandatory limits for public drinking water.

Only one reservoir is shown to exist within this tract and it appears to go dry by late summer.

Alluvial Valley Floors and Floodplains

A floodplain and an alluvial valley floor (AVF) along Squirrel Creek have been preliminarily identified. Both the floodplain and AVF appear to fall within the tract boundary (Kiewit Mining Co. 1982).

Until it can be determined whether there is a substantial threat of loss of life or property, no portion of the floodplain can be declared unsuitable. Office of Surface Mining (OSM) and Department of State Lands determination of the extent of the AVF will have to be made prior to mine plan approval.

VEGETATION

The Wolf Mountain Maintenance coal tract consists of approximately 598 surface acres. Of that, 590 surface acres (98.66%) of the area is rangeland. The balance is eight acres (1.34%) of cropland. The rangeland consists of three dominant range sites. These range sites, in acres and percentage of the coal tract, are clayey 155 (26%), shallow 201 (34%), shallow clay-silty 141 (24%). Other range site complexes total 93 acres (16%) of the coal tract. Within these range sites, there are varying production yields (pounds per acre) and condition classifications. The clayey site produced 39 AUMs (38%), shallow 13 AUMs (13%), shallow clay-silty 26 AUMs (25%), and other range site complexes 24 AUMs (24%) of the coal tract. There are approximately 102 AUMs being produced per year on the coal tract in its present condition.

AGRICULTURE

Of the 598 surface acres, only 42.81% (256 acres) of the area is suitable for cropland (Class III and IV land). Of that amount, only 1.34% (eight acres) is utilized as cropland (see Table WM-1). The balance is Class VI and VII land, which is only suitable for rangeland.

Agricultural operations are mainly livestock, with small areas of hay (alfalfa or grass-legume), small grains and tame pasture. Hay or small grains are mainly grown for livestock feed during the winter months. Some small grains are grown for sale.

Approximately eight acres of Class III and IV land (1.34%) are in tame pasture, which will provide approximately seven AUMs per year under dryland conditions. None of this land is suitable for irrigation.

In addition, there are approximately 248 surface acres of Class III and IV land (41.47%) which are not presently cropped, but are suitable for cropland. This land could produce approximately 157 tons of hay or 528 bushels of wheat under dryland farming operations. However, there are 201 acres of Class IV land that are suitable only for hay production or tame pasture. Wheat production is based on the assumption that 50% of the suitable cropland would be in summer fallow yearly. Of that acreage, there are 44 acres which could be irrigated and could yield an additional 156 tons of alfalfa hay or 1,665 bushels of wheat. This land is utilized as rangeland.

OWNERSHIP AND LAND USE

In the Wolf Mountain Maintenance tract, the entire surface (1,371 acres) is owned by an energy-related landowner. The United States owns the coal in 1,121 of the acres, of which 523 acres are currently leased.

An intermittently occupied dwelling is present near the southwest border of the tract.

WILDLIFE

There are no threatened or endangered species on the tract. Two golden eagle nests are located within a mile of the north boundary of the tract (USDI BLM 1981).

TABLE WM-1
AGRICULTURAL LAND USE TABLE
WOLF MOUNTAIN MAINTENANCE COAL TRACT

PRESENT USE OF LAND 1/	ACRES	PCT OF AREA	LAND CLASS 2/ CAPABILITY NON-IRRI-GATED	LAND CLASS 2/ CAPABILITY IRRI-GATED	PREDICTED AVERAGE YIELDS 1/ WHEAT DRY LAND (BU)	WHEAT IRRI-GATED (BU)	BARLEY DRY LAND (BU)	BARLEY IRRI-GATED (BU)	OATS DRY LAND (BU)	OATS IRRI-GATED (BU)	ALFALFA DRY LAND (TON)	ALFALFA IRRI-GATED (TONS)	TAME HAY DRY LAND (TONS)	PASTURE DRY LAND (AUMS)	PASTURE IRRI-GATED (AUMS)
Privately Owned															
Cropped (Tame Pasture)	3	0.50	III	-	66	-	105	-	-	-	3	-	2	3	-
Cropped (Tame Pasture)	5	0.84	IV	-	-	-	-	-	-	-	-	-	-	4	-
Total	8	1.34	-	-	66	-	105	-	-	-	3	-	2	7	-
Non-cropped (Range)	28	4.68	III	III	601	1,342	976	1,796	-	2,136	28	126	21	24	293
Non-cropped (Range)	3	0.50	III	-	71	-	110	-	-	-	3	-	2	3	-
Non-cropped (Range)	16	2.68	IV	III	384	816	592	928	-	1,360	14	72	13	13	160
Non-cropped (Range)	201	33.61	IV	-	-	-	-	-	-	-	112	-	84	155	-
Total	248	41.47	-	-	1,056	2,158	1,678	2,724	-	3,496	157	198	120	195	453
Total Land Suitable For Cropland	256	42.81	-	-	1,122	2,158	1,783	2,724	-	3,496	160	198	122	202	453

1/ Cropland, land suitable for cropland and average predicted crop yield derived from unpublished Rosebud County Soil Survey report, published Powder River County Soil Survey report, and data from Agriculture Stabilization and Conservation Service, Rosebud County and Powder River County.

2/ Land class capability is derived from published Big Horn County soil survey, December 1977, Soil Conservation Service and Bureau of Indian Affairs.

There is a prairie falcon nest on the tract over previously leased federal minerals. After consultation with the U.S. Fish and Wildlife Service, an exception was applied to unsuitability Criterion 13 to allow for the mining of this site with appropriate mitigation (BLM 1982).

Wintering areas for mule deer and antelope are found north and west of the tract, respectively (USDI BLM 1981). The crucial mule deer area was eliminated from consideration for mining by an unsuitability finding. The antelope wintering area would not be affected by this tract.

No significant sport fishery occurs on the tract. However, care must be taken to preserve the quality of the downstream water to protect the fishery in the Tongue River.

CULTURAL RESOURCES

All 598 acres (100%) of the surface over federal uncommitted mineral estate have been inventoried to Class III standards over several surveys. Ten sites are recorded in this area. Unsuitability Criterion 7 was applied to six of the 10 by the 1981 Powder River Amendment. Sites 24 RB 1054, 1957 and 1971 were determined not eligible to the National Register, while there was insufficient information to make a determination on 24 RB 1055, 1060, and 1966. The unsuitability criterion is now applied to the remaining four sites: 24 RB 1962 appears eligible to the National Register; 24 RB 1958 and 1959 are not eligible, lacking diagnostic artifacts and subsurface deposits; a determination on 24 RB 1966 cannot be made from the existing information.

RECREATION

This tract does not have opportunities for public recreation; however, the tract does have the potential for deer hunting. The surface of this tract is privately owned, does not have public recreation facilities nor does it have wilderness values.

VISUAL RESOURCES MANAGEMENT

The ridge located in this tract has outcrops of sandstone and shale. The slopes of the ridge and drainages have isolated growths of conifers; however, the area has a grassland-sagebrush biome. This tract does not have nor is it adjacent to a wilderness study area.

CLIMATE AND AIR QUALITY

This area is influenced primarily by a continental climate. It experiences temperature extremes, convective thunderstorms in the summer, and inversions, which often predominate in the winter. July is the warmest month and Decker experiences an average temperature of 72.3 degees Fahrenheit (°F) during July. January, the coldest month, has a mean temperature of 13.4°F, with an average annual maximum and minimum of 60.2°F, and 31.3°F, respectively. Average annual precipitation is about 13.7 inches. About 60% of this precipitation can be expected to fall from April through July. Mean monthly minimum relative humidity peaks in January at about 51%. Total evaporation from April through September for 1980 was 47.46 inches. Average annual windspeed is about 5.61 miles per hour. Northwesterly and west-northwesterly wind directions predominate with the second greatest wind occurrence from the southwest.

Although terrain offers little obstruction to dispersion of pollutants, the area experiences prolonged periods of depressed mixing heights and low wind-speeds, which tend to concentrate pollutants.

This tract's air quality is generally very good. Background level for suspended particulate was determined by TRC Environmental Consultants to be 23.4 micrograms per cubic meter (mcg/m^3), but annual geometric means range from 9 mcg/m^3 to 56 mcg/m^3 (PEDCo 1981). Gaseous pollutants are currently so low they are not even monitored.

One Class I area, the Northern Cheyenne Indian Reservation, exists about 21 miles north of this tract. Visibility in the area ranges from 45 to 70 miles with a median summer visual range of about 60 miles.

NOISE

Existing sound levels have not been measured in this area, but they are believed to be very low, probably about 20 decibels. Noise related to man's activities is presently limited to occasional blasting from other nearby mining operations. Apart from occasional blasting, existing noise is at background levels.

TRANSPORTATION FACILITIES

Approximately three-fourths mile of Montana State Route 314 lies across the southeast corner of the tract. A gravelled road running southeast to northwest lies one-half mile to a mile west of the tract. The nearest railroad link-up is two miles to the east. In the Wolf Mountain mine plan, it is proposed to build a coal conveyor to link with the rail line.

SOCIOECONOMICS

Employment and Income

The area of Big Horn County that includes the Wolf Mountain Maintenance tract is predominately an agricultural community that has, over the years, changed little. The social and economic bases of the county have thus remained untouched.

The county's market value of all agricultural products sold in 1978 was $33,722,000. The average value per farm/ranch was $67,988 which is approximately $20,000 more than the state average per farm.

Cattle ranching is the leading contributor to agricultural production followed by wheat farming. Cattle production produced approximately 23 million dollars, while wheat and hay cropland production produced approximately 10 million dollars.

Big Horn County experienced a population gain of 9.36% over the decade of the 1970's. (See Table WM-2.)

TABLE WM-2

POPULATION OF BIGHORN COUNTY

		Percent Change
1960	10,007	.00
1970	10,057	+0.50
1980	11,096	+9.36

This population growth can be primarily attributed to increased employment in the mining sector of the economy. Between 1975 and 1980, this sector of employment increased by approximately 700 people.

This increase in employment has led to a large increase in per capita income. (See Table WM-3.)

TABLE WM-3

BIGHORN COUNTY AND STATEWIDE PER CAPITA INCOME

	1975	1976	1977	1978	1979	1980
Mining Employment	262	340	473	794	928	963
Per Capita Income	$4,148	$4,195	$4,729	$6,427	$7,195	$8,082
Montana Per Capita	$5,419	$5,763	$6,172	$7,138	$7,787	$8,652

The contribution from mining has helped to increase the per capita income of the county over the years. It is still lower than the state average, but this has the potential to increase as more mining is developed.

Big Horn County's employment picture shows a decline of agricultural employment for the years 1975 through 1980. Major increases can be found in the mining and construction sectors. In 1975, direct farm employment in the county accounted for 11.9% of total employment. By 1980 that percentage had dropped to 7.4% of the total. Mining employment increased from 6.2% in 1975 to 17% of the total in 1980. Construction employment increased from 3.4% in 1975 to 10.8% of the total in 1980. The county's total employment increased more than 25% over this time period.

Community Facilities

The Wolf Mountain Maintenance coal tract is located in the southeastern part of the county. This area is thinly populated and communities in this area have not shown a tendency to grow with coal development. The attractiveness of Sheridan, Wyoming, has caused most workers in the area to commute. Sheridan will receive the greatest impact from development of new mines in this portion of the county.

The Northern Cheyenne and the Crow Indian Reservation economics are based on jobs provided by the tribal government and federal programs. There has been a slow shift from a subsistence to a cash economy, but most households still rely on hunting and gathering to supplement their incomes. Chronic unemployment is a serious problem.

Due to sparse population, most people, consumer goods and agricultural products move by roadway. The road network is not well developed but is generally adequate for the existing population.

A loose network of county and Bureau of Indian Affairs roads provides ranchers and rural residents access to the primary and secondary road systems. These are mostly gravel surfaced, with curves and grades conforming closely to the existing terrain. (Montco Mine EIS draft.)

Existent Attitudes

Several surveys over the past five years in the area have shown, on a fairly consistent basis, that most of those interviewed are in favor of mineral development. A BLM study conducted in 1979-1980, showed the principal reasons for supporting development are national energy needs and economic growth of the region. The study also showed respondents were in favor of mining controls.

CHAPTER II
ENVIRONMENTAL CONSEQUENCES

GEOLOGY AND TOPOGRAPHY

Geology

Within the mined area, the overbuden and highwall reduction strata would be destroyed. The replaced spoils would be more homogenous than the current strata.

The Anderson, Dietz 1 and 2 seams would be removed. This would preclude future use of this coal resource. Any other coal seams present in the overburden would be destroyed. Coal seams below those mined would be lost to future recovery under current reclamation laws.

Strata below the mined seams would be undisturbed. Oil and gas exploration activity would be precluded during the active mining phase. Since there are no producing wells within the area, potential delays in oil and gas exploration during active mining would probably be insignificant.

About two-thirds of the Smith scoria would be removed, primarily within the pit reduction zone. Some scoria might be used for mine haul roads and other mining ancillary activities.

Within the spoil, any paleontological resources would be at least partially destroyed. The remaining fossil material would be repositioned in the spoils.

Topography

The postmine terrain would be somewhat smoothed, leaving less relief than the present terrain. The high hill masses northeast of Squirrel Creek would remain undisturbed. According to the mine plan, the thickest coal overburden removed would be about 450 feet. High wall reduction would disturb terrain above the 450-foot overburden level or 3,755 feet elevation line.

A common spoil coefficient of expansion is 1.18. Removing 72 feet of coal would require 400 feet of overburden before the postmine average elevation would equal the present average elevation. Since most of the mineable coal has less than 400 feet of overburden, the postmine average elevation would be less than the present elevation.

SOILS

Soil impacts from mining activities include: displacement of soil from wind and water erosion, change in soil structure and natural fertility, salt migration through the soil profile after reconstruction, and signficant problems in revegetation and stabilization on steep slopes.

Disturbance of the soil would result in alterations of soil structure and porosity. This alteration would affect permeability, infiltration rates, soil-air and soil-water relationships and bulk density. The natural fertility would be affected by disruption of the nutrient cycle and a decrease in organic matter content within the soil.

The soil mapping units in the Wolf Mountain Maintenance coal tract were evaluated for suitability of soil material for plant growth using USDA/SCS guidelines for "Soil Reconstruction Material for Drastically Disturbed Areas" [NSH 403.6(a)]. These results are expressed as acre feet of soil material having good, fair, and poor suitability due to its physical and chemical properties. This showed 3% (41 acre feet) of the area rated good, 46% (643 acre feet) rated fair and 51% (706 acre feet) rated poor as to suitability for plant growth (Table WM-4).

The wind erosion for the tract is rated as 54% low, 12% moderate and 34% too variable to rate. The water erosion potential is rated as 3% low, 40% moderate and 57% high.

Areas within the tract may have better or poorer reclamation potential because of their unique soil distribution patterns. Suitable overburden materials, if available, could be used to provide additional material to provide for more adequate reclamation. Current information demonstrates that this area has fair to poor potential for successful reclamation.

WATER RESOURCES

Groundwater

Removal of coal and overburden within this tract would eliminate the well and stock pond that currently exist. The

TABLE WM-4

WOLF MOUNTAIN MAINTENANCE TRACT SOIL RECLAMATION ASSESSMENT

Mapping Unit Symbol	Mapping Unit Name	Acres	Pct of Acres	Slope	Erosion Potential from Wind	Erosion Potential from Water	Suitability of Material for Plant Growth (acrefeet) Good	Fair	Poor
Fm	Fort Collins loam	16	3	4-8%	Low	Moderate	5	75	-
Hlc	Heldt silty clay loam	15	3	4-8%	Low	Low	-	75	-
Hna	Hydro loam	1	<1	0-8%	Low	Moderate	-	-	5
Lv	Lohmiller-Midway silty clay loams	140	23	4-15%	Low	Moderate	-	53	514
Ms	McRae loam	13	2	4-8%	Low	Moderate	5	59	-
MVf	Midway-Thedalund complex	141	23	15-35%	Low	High	-	24	137
On	Olney fine sandy loams	5	1	4-12%	Moderate	Moderate	3	22	-
SOc	Shale outcrop-Midway complex	201	34	25-90%	--*	High	-	211	50
THs	Thedalund-Midway complex	66	11	8-15%	Moderate	Moderate	28	124	-
	Totals	598	100				41	643	706
	Percent of Acrefeet						3%	46%	51%

* Too variable to rate.

resulting pit would act as a well and intercept groundwater flow, which would be pumped back to surface ponds and eventually stream channels. Drawdown of water tables and potentiometric surfaces caused by this dewatering would be restricted within a block formed by northeast-trending faults. These drawdowns would merge with existing drawdowns from the Decker mine and the resultant combined effect would be substantial. Ten stock and domestic wells producing water from coal beds exist in this block (Van Voast 1981).

Pit intercepted water that would be returned to the surface would be similar chemically to a mixture of concentrations of all waters received. The more water received as alluvial source, the lower the water quality would be. Dissolved-solids content of this water should be about 1,620 mg/l.

Spoil material placed back in the pit would result in degraded quality of water that recharges and passes through the spoils. Water quality impacts would be limited to the mined areas and downgradient. Dissolved-solids concentrations have been predicted to be about 2,550 mg/l. Principal constituents of the increased dissolved-solids would be sodium, bicarbonate and sulfate. Aquifers below the Canyon coal bed could be utilized for alternative water supplies. In this area, it can be up to 640 feet to the bottom of the Canyon coal. Existing wells are as deep as 522 feet.

Surface Water

Surface water would be affected by surface mining primarily during the mining period, when existing drainage patterns in parts of the area would be displaced, runoff would be intercepted and existing reservoirs would be removed from the mined area. Since alluvium is likely to be drained by mining, streamflow may be slightly reduced as water infiltrates to the alluvium. Channels might have to be diverted around the mine pit to carry their natural flows. The channelization could decrease annual and low flow rates because of seepage loss to the pit. Peak flows should be somewhat reduced. Water discharging from the disturbed areas, after passing through sediment ponds, would have nearly all sediment removed, thus increasing erosive capabilities of the water.

Channelization of stream courses would cause increased flow velocities and the release of production water, including mine drainage, could alter the flow characteristics of streams. Erosion and sedimentation might increase during construction and operation of the mine, after the removal of vegetation and before its reestablishment of reclaimed areas.

Alluvial Valley Floors and Floodplains

Plants drawing from subsurface water (subirrigation) in the alluvium would be influenced to a slight degree by increased groundwater chemical concentrations following mining. The effect would be greatest in the subirrigated land adjacent to the tract; downstream land would not be affected as much because less concentrated water from outside the tract would dilute the increases in concentrations from mining the tract. Crops that are more sensitive to salts would be affected more than less sensitive ones. For example, alfalfa is more sensitive than barley.

VEGETATION

If the range were in excellent condition (76%-100%) and the entire area were mined, there would be an approximate loss of 110 to 160 AUMs. However, in its present condition, the loss would be approximately 102 AUMs.

Mining of the area would temporarily eliminate opportunities for domestic livestock to occupy the surface and to utilize the forage. However, vegetative production may be better after mining (due to extensive reclamation work) and the area may produce more than the current number of AUMs per acre. There is, however, no evidence that the plant community that ultimately evolves would support higher levels of livestock grazing than the premining vegetation supported.

Additional impacts resulting from vegetative disturbances would be: (a) possible reduction of the visual aesthetics, (b) increased soil erosion, and (c) reduction in the amount of wildlife and livestock forage.

AGRICULTURE

If this area is mined, there would be approximately 256 surface acres suitable for cropland that would be lost for the term of mining and reclamation operations. This land could produce approximately 561 bushels of wheat (based on 50% land, summer fallow; 50% land, wheat) or 160 tons of hay annually under dryland conditions. However, of the 256 acres there are 65 acres suitable for only tame pasture and 140 acres suitable for only hay production and tame

pasture. There are 44 acres suitable for irrigation that could produce an additional 156 tons of hay or 1,665 bushels of wheat annually. However, only eight acres (3.13%) of the suitable cropland is currently utilized as cropland.

OWNERSHIP AND LAND USE

As a result of leasing, industrial activities would be further accelerated in an area that has three existing strip mines and plans for a fourth to be located adjacent to the southwest portion of this tract. Therefore, the impacts from mining this tract due to construction of new access roads, improvement of existing roads, relocation of existing power and telephone lines, and construction of new powerlines is expected to be low to moderate.

State Route 315 crosses the southeast corner of this tract. Assuming a 100-foot right-of-way, relocating this road would disturb a minimum of 12 acres.

The dwelling located near the southwest border of that tract would be removed for mining. However, since the property and improvements are owned by an energy company, there would be no negotiation necessary.

WILDLIFE

A prairie falcon nest on the leased portion of the tract would be destroyed if the area is mined. Prior to mining the nest site, the mitigation plan calls for providing alternate nesting sites.

Poaching and road kills have increased dramatically in areas of Montana, Wyoming and Colorado where energy development has occurred. The problem is compounded in areas where shift changes coincide with feeding periods, especially big game (Streeter, et al 1979). Extreme care must be taken in mining this tract because of the proximity of big game wintering areas.

CULTURAL RESOURCES

Under the proposed mining action, destruction would occur of all cultural sites in the mine area and an adverse effect would be sustained by sites immediately adjacent from haul roads, vehicle traffic and soil erosion. Prior to mining, any remaining survey areas would be surveyed to Class III specifications. The exception to Criterion 7 would be applied to eligible sites in the mine plan area, and the sites mitigated through data recovery techniques, pending consultation with the State Historic Preservation Officer.

RECREATION

Mining this tract would disturb wildlife habitat; thus, hunting and wildlife enjoyment would be affected. Actual loss of recreational activity would be low as the area has been closed to public use.

VISUAL RESOURCES MANAGEMENT

Mining this area would alter the tract characteristics. Mine facilities, access roads, railroad, communication and utility structures, overburden and the removal of coal would change the form, line and color of this tract. Dust from the mining activity and the aforementioned visual impacts may be visible from Montana Highway 314 and the nearby community of Decker. Mining should not have any affect upon either the Crow or Northern Cheyenne Indian Reservations.

CLIMATE AND AIR QUALITY

Impacts on climate from the proposed action would be localized and insignificant. Reclamation would mitigate any impacts, over the long term, that surface modifications would have on climate conditions.

The effects from mining on this tract would be a continuation of the situation created by mining in the area, particularly at the adjacent proposed Wolf Mountain mine.

The most site specific of analysis of air quality impacts from mining this area was conducted by TRC Environmental Consultants for Consolidation Coal Company's proposed CX Ranch mine. The CX Ranch mine was considered by itself when examining compliance with ambient air quality standards. The annual geometric mean was determined to be 49.7 micrograms per cubic meter (mcg/m^3), which included background concentrations. This is well within the state standard of 75 mcg/m^3. Total 24-hour concentration indicating maximum short term impact was modeled to be 118.7 mcg/m^3. This predicted concentration includes background levels and is within the state standard of 200 mcg/m^3.

In addition to the annual and maximum particulate standard, Montana has a Prevention of Significant Deterioration (PSD) incremental standard which dictates the maximum increase in ambient pollution levels for two pollutants, TSP and sulfur dioxide. This area has been designated PSD Class II, which allows for moderate, well-controlled growth. Sulfur dioxide is not a pollutant produced from coal mining itself and will not be considered under PSD standards.

Unlike ambient air quality standards, PSD standards require pollution from all new sources in an area to be counted against the allowable increase. Modeling for PSD increment requirements included the Nerco mine as well as the CX Ranch mine. Increases in coal dust from the two mines was modeled to be 32.56 mcg/m^3 (for the 24-hour averaging time) which is within the 37 mcg/m^3 allowed. Annual increment consumption was modeled to be 5.83 mcg/m^3, which is also within the 19 mcg/m^3 allowed. Consideration of mining in this tract may have to address pollutants from both the Nerco and CX Ranch mines in addition when evaluating compliance to PSD increment requirements.

Visibility reductions resulting from mining would be slight. PEDCo Environmental estimated visibility reductions from the second highest 24-hour concentration of particulate matter for the North Decker tract, which is very close to this tract. They reported a maximum decrease of 0.1 mile from their hypothetical viewing point and a maximum of 0.1 mile when looking from the Northern Cheyene Indian Reservation.

More detailed and site specific air quality data from this tract will be forthcoming from a study underway by PEDCo Environmental. A more accurate prediction of impacts to air quality will be included in the study results.

NOISE

Mining on this tract would extend the effects of mining on the proposed Wolf Mountain mine adjacent to this tract. Environmental consequences of noise associated with mining have not been characterized for this area recently. The situation around Decker should be similar to that around Colstrip and work completed for Colstrip is reported here.

Among activities causing noise would be construction. A "worst case" estimate of construction sound levels would be 92 dBA at a distance of 50 feet. This would occur only if all equipment were operating in the same location. Attenuation of this sound level due to distance alone would reduce construction noise to about 34 dBA at a distance of six to seven miles.

Combined noise level of mining activity would be about 98.3 dBA, estimated conservatively. This level would be reduced by distance alone to about 46 dBA six to seven miles away from the mine site. Other factors involved in reducing noise over distance are ground effects, humidity, absorption by the atmosphere, refraction due to temperature and wind, and grass ground cover. With all factors operating together, mining noise should be reduced to background at a distance of six to seven miles. Blasting noise could still be heard, but its occasional and intermittent occurrence would be at most a nuisance.

Effects of mining noises on animals is often that of dispersing them into areas away from the mine site. Experience is showing, however, that animals do become accustomed to a mine and return to reclaimed areas with the mine still in operation. Western Energy Company has an established sharp-tailed grouse lek on one of their reclaimed areas and they often see deer frequenting the site. Indeed some researchers have complained of the nuisance wild animals can be in revegetation attempts (Schwarzkoph 1982).

TRANSPORTATION FACILITIES

Approximately three-fourth mile of State Route 314 would be relocated if the tract is mined. If the existing gravel road along Squirrel Creek is used for access, it would require widening and resurfacing to handle increased traffic, which would result from activity at the proposed Wolf Mountain mine adjacent to this tract. The impacts are expected to be low to moderate.

SOCIOECONOMICS

Economics (Agriculture)

Coal development displaces some agricultural production. To evaluate this issue, it is necessary to compare the value of the agricultural production displaced with that of the coal which could be developed.

The trade-off was compared two ways. One was to compare the net national value of agricultural production displaced with the net national value of coal produced. In this evaluation, it was assumed the net value of coal is 12.5% (minimum royalty rate) of the assumed market rate for coal of $10 per ton. The net value of agricultural production is the cash rent to the landowner. A "worst case" situation was assumed for agriculture, that is, the area would not be reclaimed. Since agricultural production would be lost on each acre, year after year, these losses were totalled to show losses in perpetuity. By comparison, coal output per acre would be gained only once. To place agricultural production and coal on the same time basis, it was necessary to discount the value of agricultural output lost in future time periods. Regardless of inflation, a loss in agricultural production in the future is worth less than if it were lost today, because of the time value of money.

Under these assumptions, Table WM-5 shows the return to national income from coal production would be over 3,540 times greater than agricultural production.

Another way of comparing the trade-off between coal and agricultural resources is to determine what coal would have to sell for to equal agricultural production displaced. This avoids assuming all coal in the area could be sold for the going market value. Table WM-5 shows that coal would have to sell for only $.00035 per ton to be equal to the net agricultural value displaced.

Concern has been expressed that extensive strip mining could have an effect on the supply of agricultural land and, thus, the national food supply. To gain a perspective on this issue, the value of agricultural production to be potentially displaced by mining can be compared with the value of agricultural output in the consideration area. Table WM-6 shows mining of the federal coal in the consideration area in Big Horn County could displace .008% of the county's agricultural production of cattle, which had a value in 1978 of approximately $23,000,000.[1]

A "worst case" scenario was assumed, in the above comparison, that the area would not be reclaimed. Existing state and federal laws require the lands to be returned to the approximate original contour and be reseeded to native species. Evidence collected on current reclamation efforts suggests postmining productivity is similar to premining productivity, at least in the short term. Long-term results are yet to be evaluated as reclaimed lands have not been monitored over a long period of time.

Regional Economics

This tract of coal would extend the life of the proposed Wolf Mountain mine. This proposed mine is in the permitting stage and due to uncertainty of the market for coal, it is not pssible to determine actual tonnage figures, employment figures and time frames at this time. Community leaders of all possible impacted communities should establish communications with the present lessee at the earliest opportunity. This communication would enable community leaders to have access to figures and time frames of the proposed mine.

This maintenance tract would have no regional effect as it only extends the life of the proposed mine. It would continue to allow Big Horn County to collect taxes and would also provide additional royalties and severance taxes to the State of Montana.

Employment of Crow and Northern Cheyenne Indians would continue at the same level as the initial employment of the mine. Reservation road use would remain at the same level that is required to support the proposed mine.

NET ENERGY ANALYSIS

A net energy analysis calculated by the BLM (W.O. IM 79-282) indicates that an average of 37.7 British thermal units (BTUs) would be expended to produce each pound of coal from the Wolf Mountain maintenance tract. In turn, a pound of coal would produce about 9,591 BTUs (Anderson Seam). The ratio of energy produced to that expended would be more than 254 BTUs to 1 BTU.

[1]Census of Agriculture, Department of Commerce, U.S. Government Printing Office, Washington D.C. 1982.

TABLE WM-5

COMPARISON OF VALUE OF AGRICULTURAL PRODUCTION DISPLACED
TO VALUE OF COAL PRODUCTION

Agricultural Production							Coal Production				
Crop	Acres	Annual Ag Production	Net Value Per Unit	1/ Total Annual Net Value $	2/ Total Present Value at 10%	3/ Per Acre Loss If Mined	Federal Acres	Recoverable Tons/Acre	4/ Net Value per ton $	5/ Total Present Value (000)	6/ Ratio to Ag Prod.	7/ Value per ton to equal Ag. Prod.
Tame Past.	8	7 AUMs	$10/AUM	$70	$700	$18.22	598	51,622	$1.25	38,587	3,540 to 1	$.00035
Rangeland	590	102 AUMs	$10/AUM	$1,020	$10,200							
Total	598			$1,090	$10,900							

1. Annual agricultural production x net value per unit
2. Total present value discounted at 10%
3. Total present value/total acres
4. 12.5% x assumed value of $10.00 per ton at mine mouth
5. Acres x tons/acre x net value per ton
6. Total present value (coal)/total present value (agriculture)
7. Agricultural production per acre loss if mined/tons per acre

TABLE WM-6
COMPARISON OF COAL TRACT ANNUAL AGRICULTURAL PRODUCTION
TO COUNTY AGRICULTURAL PRODUCTION

CATTLE

Annual Production (AUMs)	1/ Annual Sales	Percent of County Sales	Gross Annual Agr. Sales by Coal Area	2/ Gross Annual Agri Sales by County	3/ % of County Agri Prod. Displaced
109	$2,725	.012	$2,725	$33,722,000	.008

1. AUMs -:12 AUM/Cow = cow units x 300 sales per cow unit = value of annual cattle production
2. 1978 Census of Agriculture, Department of Commerce, US Printing Office, Washington, DC, June 81
3. Value of production displaced as a percentage of all agricultural production in the county

REFERENCES

SOILS

U.S. Department of Agriculture, Soil Conservation Service and U.S. Department of the Interior, Bureau of Indian Affairs in cooperation with the Montana Agricultural Experiment Station 1971. Soil Survey of Big Horn County Area, Montana.

U.S Department of Agriculture, Soil Conservation Service. National Soil Handbook 403.6(a).

WATER

Kiewit Mining and Engineering Co. 1982. Wolf Mountain Mine Plan. Sheridan, Montana.

Levings, G.W. 1981. Selected Hydrogeologic Data from the Northern Great Plains Area of Montana. U.S. Geological Survey Open-File Report 81-534.

Van Voast, W.A., Thompson, K.S. 1981. Hydrology of the lower Squirrel Creek drainage, Southeastern Montana with special reference to surface coal mining. Montana Bureau of Mines and Geology, Open-File Report MBMG 84.

U.S. Geological Survey 1981. Water Resources Data, Montana Water - data report MT-81-1 Volume 1. Hudson Bay and Missouri River Basins.

CLIMATE AND AIR QUALITY

Kiewit Mining and Engineering Co. 1982. Wolf Mountain Mine Plan. Sheridan, Montana,

Bureau of Land Management 1982. Environmental Assessment of Squirrel Creek Noncompetitive Lease Area in Big Horn County, Montana. Miles City, Montana

Bureau of Land Management 1981. Site specific analysis of the North Decker tract, by PEDCo Environmental.

NOISE

Montana Department of State Lands and U.S. Office of Surface Mining 1982. Final Western Energy Company's Rosebud Mine Area C, Block 1 environmental impact statement. Helena, Montana

Scharzkoph, B. 1982. Personal communication. Western Energy Company wildlife biologist. Colstrip, Montana.

RECREATION

Color Infrared Photos, Decker-Birney 1979.

U.S. Geological Survey Quadrangle Maps.

U.S. Department of the Interior, Bureau of Land Management, Powder River Resource Area MFP Amendment, November 1981 Draft.

VISUAL RESOURCE MANAGEMENT

Color Infrared Photos, Decker-Birney 1979.

U.S. Geological Survey Quadrangle Maps.

U.S. Department of the Interior, Bureau of Land Management, Powder River Resource Area MFP Amendment, November 1981 Draft.

WILDLIFE

Bureau of Land Management 1982. Miles City District Office letter 3500/M061686 to Mr. Walter Swain, Office of Surface Mining, Denver, Colorado dated September 1, 1982.

Streeter, Robert G., R. Moore, J. Skinner, S. Martin, T. Terrel, W. Klimstra, J. Tate, and M. Nolde 1979. Energy Mining Impacts and Wildlife Management: Which Way to Turn. Transactions of the 44th North American Wildlife and Natural Resources Conference. Wildlife Management Institute, Washington, D.C.

U.S. Department of Interior, Bureau of Land Management 1981. Powder River Resource Area Management Framework Plan Amendment Draft. BLM, Miles City, Montana.

APPENDIX

WOLF MOUNTAIN MAINTENANCE
UNSUITABILITY SUMMARY

UNSUITABILITY CRITERIA RESULTS

Criterion	Applicable to Tract	Exception Used	Additional Data Needed	Comments
1. Federal land systems	No			
2. Rights-of-way and easements	No			
3. Buffer zones for roads, buildings, etc.	Yes	Yes		
4. Wilderness study areas	No			
5. Scenic areas	No			
6. Land used for scientific study	No			
7. Historic lands and sites	Yes	Yes/No		Consultation not complete.
8. Natural areas	No			
9. Federally listed endangered species	No			
10. State listed endangered species	No			
11. Eagle nests	No			
12. Eagle roosts and concentration areas	No			
13. Falcon cliff nesting sites	Yes	Yes		Nest is in leased portion.
14. Migratory birds	No			
15. State high-interest fish and wildlife	No			is a high use mule deer winter range just north of the tract.
16. Floodplains	Yes			No area found unsuitable.
17. Muncipal watersheds	No			
18. National Resource Waters	No			
19. Alluvial valley floors	Yes			Preliminary determination. Determination being made by DSL and OSM.
20. State proposed criteria	No			

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
WOLF MOUNTAIN MAINTENANCE LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
GEOLOGY AND TOPOGRAPHY					
Geology					
Leasables	No obstacles to any exploration activity	No active exploration activity during active mine life	Low	Good	
Saleables	About 40 acres of Smith scoria present	About 30 acres destroyed by mine pit reduction	Low	Good	
Paleontology	Some fossil leaves, freshwater fossils and petrified wood are present	Some fossil destruction, rearrangement of other fossil material.	Low	Good	
Topography	Squirrel Creek valley bottom with associated hills along valley edge	Topography would be more uniform. Average.	Moderate	Good	

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
WOLF MOUNTAIN MAINTENANCE COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
SOILS	Nine soil mapping units have been identified in the tract. Soils range from shallow shale outcrop to deep well drained soils. Slopes are nearly level to steep.	There would be displacement of soil by water and wind erosional forces; change in soil structure and natural fertility, and significant problems in revegetation and stabilization on steep slopes.	Moderate to high	Data reliability is 80% from the Big Horn County Soil Survey. Better soils in the bottomlands are more accurately mapped than those on the rangelands and steep-sided slopes.	
WATER RESOURCES					
Groundwater					
Occurrence	One well in tract. Ten wells could be affected by mining. Static water levels range from 2.5 to 250 feet.	Destruction of existing well and drawdown and possible water quality degradation of others.		There may be more wells in tract.	Supplies could be replaced by deeper wells at considerable expense.
Quantity	10 gallons per minute				

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
WOLF MOUNTAIN MAINTENANCE COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
Conductance	806 - 6,981 micromhos per centimeter	Higher in reclaimed spoils.		Good	
Dissolved solids	124 - 6,292 milligrams per liter.	Higher in reclaimed spoils aquifer.		Good	
pH	7.3 - 8.8	Lower in spoils aquifer		Good	
Importance for homes or towns	Probably some domestic use.	Loss of present supply	Moderate		
Importance for industry	Nil				
Importance for livestock and wildlife	Primary use	Loss of present supply	Moderate		
Importance for agriculture	Nil				
Surface Water					
Occurrence	One perennial stream. One small reservoir.				
Quantity	Squirrel Creek, 3,050 acre feet per year. Reservoir unknown.	Interception of runoff; loss of reservoirs during mining.	Moderate		

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
WOLF MOUNTAIN MAINTENANCE COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
Conductance	860-4,270 micromhos per centimeter			Good	
Dissolved Solids	1,970 - 3,844 milligrams per liter.	Possible increase during mining.	Minimal	Good	
pH	8.0 - 8.6	Little change		Good	
Importance for homes or towns	Nil				
Importance for industry	Nil				
Importance for livestock and wildlife	Primary use	Loss of some supplies during mining	Moderate		
Importance for agriculture	None in the boundary of this tract.				

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
WOLF MOUNTAIN MAINTENANCE COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
VEGETATION	Range Sites: (Acres) Shallow 201 Clayey 155 Sh. Clay Si 141 Other 93 Total 590	Acres being disturbed: (Acres) Shallow 201 High Clayey 155 High Sh. Clay, Si 141 High Other 93 Low Total 590	High - - - - Long term elimination of the natural vegetation mosaic and species diversity	Good	Reclamation of Ponderosa pine not yet proven
Animal Unit Months	102 AUMs	High	Loss of 102 AUMs - High	Good	
Animal Unit Months if range is in excellent condition 76-100%				Good	76% 100% 110 160 AUMs AUMs

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
WOLF MOUNTAIN MAINTENANCE COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
Threatened Endangered or Noxious Species	There are no threatened or endangered plant species found growing in the tract. However, there are six noxious species found growing in the Powder River Resource Area, but it has not been determined if these species are found growing in the tract. The species are: A. Convolulus aruensis B. Cirsium arvense C. Euphorbia esula D. Centaurea ropens E. Cardaria draba F. Centaurea maculosa	Low	Low	Good May 16, 1980 Regional Director, Region 6 US FWS Denver, CO	
Reclamation Vegetation	On federal, state and private lands, the Office of Surface Mining (OSM) assures that the mining company establish a diverse, effective and permanent vegetative cover to standards set by the Department of State Lands of Montana and the federal Bureau of Land Management	Low	High-failure of reclamation, Low-success of reclamation	Good	

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
WOLF MOUNTAIN MAINTENANCE COAL TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
AGRICULTURE	256 acres suitable for cropland. Eight acres currently being cropped (tame pasture).	Maximum of eight acres current cropland removed from production for term of mining and reclamation operations.	Very low	Fair	
LAND USE	Ranching is primary use. One intermittently occupied dwelling. Coal mines located north and east of tract.	Increase in present industrial activity. More land used for mines, roads, and power lines.	Low to moderate during mining. Low to none after reclamation.	Good	
WILDLIFE					
Mule Deer and Antelope	Wintering areas north and west of tract.	SLight disturbance on winter range.	Low	Good	
Prairie Falcon	One nest on the tract	Nest would be destroyed - mitigation necessary	Low - with mitigation	Good	
Fish	No sport fishery on the tract.	Insignificant	Insignificant	Good	
Threatened and Endangered Species	None on tract.	None		Good	

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
WOLF MOUNTAIN MAINTENANCE COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
CULTURAL RESOURCES	All 1,370 acres in the mine tract have been inventoried to Class III standards.	Disturbance and destruction of all sites within mine area, indirect effects to sites adjacent.	Loss of resource, loss of heritage values.	Accumulated data is good.	Prior to mining, company must submit mine plan to state, including mitigation plan for NRHP sites.
RECREATION	This tract lacks recreational development. Hunting is probably the only recreation activity on this tract.	Loss of wildlife habitat would affect hunting.	Low	Good	
VISUAL RESOURCES	Scenic quality rates as Class C. The tract rates as Class IV in regard to management classes.	Classification would change to Class V during life of mine.	Effect would be high during life of mine, but low in the long term because reclamation would restore tract to Class IV.	Good	
AIR QUALITY	Concentration of particulates estimated at 23.4 mcg/m^3 (Mt standard is 75 mcg/m^3).	Highest ambient concentration of particulates would be 49.7 mcg/m^3.	Minor	Fair	

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
WOLF MOUNTAIN MAINTENANCE COAL LEASING TRACT

Element	Present Situation	Anticipated Effect of Leasing and Development	Significance of Anticipated Effect	Data Reliability	Comments
NOISE	Typical rural with occasional blasting noise. Estimated noise level 29 dBA.	Substantial increase in noise due to blasting, equipment, and more vehicle and railroad traffic. Combined noise level of about 98.3 dBA at 50 feet would be attenuated with distance.	Insignificant	Fair	Northern Cheyenne Indian Resevation would not be adversely affected.
TRANSPORTATION	Existing access via State Route 314.	Increase in traffic.	Low		
	High use and maintenance. Portion of route lies across tract.	Relocation of portion of State Route.	Low to moderate	Good	
	Existing access via county gravel road. Low use and maintenance.	Increase in traffic.	Low to moderate	Good	

APPENDIX

SUMMARY OF RESOURCE AND ENVIRONMENTAL CONSIDERATIONS
WOLF MOUNTAIN MAINTENANCE COAL LEASING TRACT

AGRICULTURAL ECONOMICS

Affected Community	Affected Element ($1000)	Anticipated Effect of Action $1,000	Assumptions	Significance of Effect
Big Horn County	1978 Annual Agricultural Receipts $ 2,725			Low
		- $ 2,725	Assumes all 109 AUMs are lost for life of mine. Less than 1% of county agricultural production.	Low

UNITED STATES DEPARTMENT OF THE INTERIOR
MINERALS MANAGEMENT SERVICE

PART II

1984 Lease Sale — Coal

Summary Report — Wolf Mountain Maintenance Tract
Northern Powder River Basin
Big Horn County, Montana

North Central Region
Billings, Montana

November 8, 1982

TRACT SUMMARY REPORT

Minerals Management Service, North Central Region
Billings District
Billings, Montana

Date: November 8, 1982

TRACT DESCRIPTION

Tract Name: Wolf Mountain Maintenance No.:

Coal Region: Powder River

State: Montana County: Big Horn

BLM Resource Area and Planning Unit: Powder River RA; Squirrel Creek Coal Field - Decker-Birney Planning Unit

USGS Quadrangle Maps: Pearl School, Decker

Legal Description: See Attachment A and Attachment B (Tract Location Map)

Known Recoverable Coal Resource Area (KRCRA): Northern Powder River

Tract Acres (by BLM)

Federal Uncommitted:	598
Federal Committed:	524
State:	0
Private (Fee):	249
Total Tract:	1371

Approximate Acres Underlain by Coal:

Federal Uncommitted:	598
Federal Committed:	524
State:	0
Private(Fee):	249
Total Tract:	1371

Estimated In-Place Coal Tonnage:

Federal Uncommitted:	82.31 MMT
Federal Committed:	82.09 MMT
State:	0 MMT
Private (Fee):	32.78 MMT
Total Tract:	197.18 MMT

Estimated Recoverable Coal Tonnage:

Federal Uncommitted:	30.87
Federal Committed:	34.26
State:	0
Private (Fee):	17.91
Total Tract:	83.04

ENTITIES EXPRESSING INTEREST

Kiewit Mining & Engineering Company
Meridian Land and Mineral Company

COAL RESOURCE CLASS DESIGNATION

CLASS 1: Good

Confidence in resource estimates is good because the surface areas of category "A" and "B" resources cover two-thirds or more of the total surface area of the tract

CLASS 2: Moderate

Confidence in resource estimates is moderate because the surface areas of category "A" and "B" resources cover one-third to two-thirds of the total surface area of the tract.

CLASS 3: Poor

Confidence in resource estimates is poor because the surface areas of category "A" and "B" resources cover one-third or less of the total surface area of the tract.

POTENTIAL FOR DEVELOPMENT OF TOTAL TRACT
WOLF MOUNTAIN MAINTENANCE TRACT

EVALUATION FACTORS	CLASS 1	CLASS 2	CLASS 3
Coal Resources	X		
Coal Quality	X		
Transportation	X		
Minability		X	
Marketability	X		
Overall Class	X		

See Attachment C.

COAL RESOURCE CATEGORY DEFINITIONS

CATEGORY "A" RESOURCES

Resource quantity is estimated from data sources that are adequately spaced to assume, with a high degree of confidence, continuity between data points. The geologic character of the area is well defined. The resources for the Wolf Creek Maintenance tract also meet the demonstrated reserves category of USGS Bulletin 1450-B.

CATEGORY "B" RESOURCES

Resource quantity is based on an assumption of continuity between data points with a lower confidence level than that of category "A" resources. The geologic character of the area is not as well defined as category "A" resources.

CATEGORY "C" RESOURCES

Resource quantity is based on an assumption of what can reasonably be expected to exist in the same producing region under analogous geologic conditions with a lower confidence level than that of either category "A" or "B".

POTENTIAL FOR DEVELOPMENT OF TOTAL TRACT
TOTAL IN-PLACE TONNAGE OF WOLF MOUNTAIN MAINTENANCE TRACT

Coal Bed	Average Thickness	Resources (million short tons)		
		Category A	Category B	Category C
Smith	12	3.40	---	---
Anderson	32	15.09	---	---
Dietz 1	20	11.37	---	---
Dietz 2	18	43.93	---	---
Anderson/ Dietz 1	54	86.80	---	---
Anderson/ Dietz 1 & 2	80	34.45	---	---

Coal Rank: Subbituminous
Unit Weight: 1770 tons per acre-foot

IN-PLACE TONNAGE - FEDERAL UNCOMMITTED

TRACT: Wolf Mountain Maintenance

Coal Bed	Average Thickness	Resources (million short tons) Category A	Category B	Category C
Smith	12	3.04	---	---
Anderson	32	5.10	---	---
Dietz 1	20	6.47	---	---
Dietz 2	18	21.20	---	---
Anderson/ Dietz 1	54	43.40	---	---
Anderson/ Dietz 1 & 2	80	0.99	---	---

Coal Rank: Subbituminous
Unit Weight: 1770 tons per acre-foot

IN-PLACE TONNAGE - FEDERAL COMMITTED

TRACT: Wolf Mountain Maintenance

Coal Bed	Average Thickness	Resources (million short tons) Category A	Category B	Category C
Smith	12	.36	---	---
Anderson	32	4.10	---	---
Dietz 1	20	1.60	---	---
Dietz 2	18	13.27	---	---
Anderson/ Dietz 1	54	29.70	---	---
Anderson/ Dietz 1 & 2	80	33.05	---	---

Coal Rank: Subbituminous
Unit Weight: 1770 tons per acre-foot

IN-PLACE TONNAGE - PRIVATE (FEE)

TRACT: Wolf Mountain Maintenance

Coal Bed	Average Thickness	Resources (million short tons) Category A	Category B	Category C
Smith	---	---	---	---
Anderson	32	5.90	---	---
Dietz 1	20	3.31	---	---
Dietz 2	18	9.45	---	---
Anderson/ Dietz 1	54	13.70	---	---
Anderson/ Dietz 1 & 2	80	.43	---	---

Coal Rank: Subbituminous
Unit Weight: 1770 tons per acre-foot

OVERBURDEN/INTERBURDEN THICKNESS RANGES

The following coal beds are listed in descending order. The Smith seam is eroded over most of the tract; therefore, the Anderson and Anderson-Dietz combinations show overburden and interburden.

Smith	overburden	- Min. 0 feet	Max. 225 feet
Anderson	overburden	- Min. 195 feet	Max. 540 feet
Anderson/Dietz 1	overburden	- Min. 195 feet	Max. 535 feet
Anderson/Dietz 1	interburden	- Min. 238 feet	Max. 288 feet
Anderson/Dietz 1 & 2	overburden	- Min. 125 feet	Max. 220 feet
Dietz 1	interburden	- Min. 0 feet	Max. 8 feet
Dietz 2	interburden	- Min. 0 feet	Max. 2 feet

COAL GEOLOGY OF THE WOLF MOUNTAIN MAINTENANCE TRACT

The coal seams in the Wolf Mountain Tract are in the Tongue River Member of the Fort Union Formation (Paleocene). Surficial deposits include Pleistocene terrace alluvium and Holocene alluvium (Law and Grazis, 1980). The four coal seams delineated in this tract are, in descending order, the Smith, Anderson, Dietz 1 and Dietz 2 (Law and Grazis, 1980; Baker, 1929). The Smith seam is extensively eroded across the area and forms the northeast boundary of the tract.

The Dietz 1 and Dietz 2 are combined on the western edge of the tract and converge with the Anderson seam in sec. 24, T. 9 S., R. 39 E., to form a coal seam 80 feet thick. The Dietz 2 diverges from the 80-foot seam in the eastern part of the tract and the Anderson, Dietz 1 and Dietz 2 all diverge on the southeastern half of the tract.

The tract is cut by several northeast-trending faults which have displacements up to 240 feet. Many of the faults have rotated, forming a complicated geologic structure.

COAL QUALITY - WOLF MOUNTAIN MAINTENANCE TRACT (as received)

(Values in percent, except BTU)

Coal Bed	Number of Samples	Moisture	Volatile Matter	Fixed Carbon	Ash	Sulfur	BTU/lb
Smith *	2	25.91	33.52	34.09	6.27	0.705	8,548
Anderson**	29	23.21	31.47	41.69	4.31	.25	9,591
Dietz 1	30	22.54	32.53	41.17	4.02	.37	9,744
Dietz 2	29	23.49	30.91	41.18	4.82	.32	9,463

* Coal quality taken from drill holes 5-8 miles south of tract.
**Coal analysis taken from Wolf Mountain Mine surface coal mine permit application, Vol. 22, 322-(2)-3, Coal Quality Summary Report

Coal quality is considered to approximate the quality of the total tract.

POTENTIAL USE OF COAL: Electrical generation plant

TRANSPORTATION:

	Mode	Distance to Transportation Link
Existing	Railroad	2 miles
Being Developed		
Being Planned		
None Planned		

MINABILITY:

Type of Mine: Surface, employing truck-shovel methods

Estimated Recovery:

Based on current practices in the Powder River Basin coal region, a recovery factor of 90 percent is typical. However, this percent recovery may or may not be attained.

Estimated Annual Production:

Federal Uncommitted: 1.2 million tons

Total Tract: 3.0 million tons

Estimated Mine Life: 26 years

Estimated Surface Acres to be Mined Per Year:

Federal Uncommitted: 10

Total Tract: 26

Active, Inactive, and Abandoned Mines or Leases in Tract Vicinity:

The West Decker Mine is located 2 miles to the east, Spring Creek Mine 5 miles to the north, and East Decker Mine 5 miles to the east.

MARKETABILITY

The expressor of interest has submitted a mine plan covering the committed federal coal and adjacent fee coal. The uncommitted federal coal in this tract would add to the life of this mine. The Class 1 ratings for coal resource, coal quality, and transportation and the Class 2 minability result in a Class 1 rating for market potential.

OVERALL

In consideration of the other evaluation factors, an overall rating of Class 1 was applied.

DEFINITIONS AND ASSUMPTIONS FOR THE WOLF MOUNTAIN MAINTENANCE TRACT:
See Attachment D

REFERENCES: See Attachment E

TRACT LEGAL DESCRIPTION

WOLF MOUNTAIN MAINTENANCE

Principal Meridian, Montana

FEDERAL UNCOMMITTED	Acres
T. 9 S., R. 40 E.,	
sec. 19, lot 2, S1/2NE1/4, and SE1/4NW1/4;	157.61
sec. 20, SW1/4NW1/4, N1/2SW1/4, SE1/4SW1/4, and SW1/4SE1/4;	200.00
sec. 29, NE1/4 and N1/2SE1/4.	240.00
Total	597.61
Rounded Total	598

FEDERAL COMMITTED	
T. 9 S., R. 39 E.,	
sec. 24, lot 1, N1/2 lot 2, E1/2SE1/4 lot 2, NW1/4NE1/4, NE1/4 NW1/4, and NE1/4NW1/4NW1/4;	156.11
T. 9 S., R. 40 E.,	
sec. 19, lot 3, E1/2SW1/4 and SE1/4;	277.65
sec. 20, SW1/4SW1/4;	40.00
sec. 29, NE1/4SW1/4 and NE1/4NW1/4SW1/4.	50.00
Total	523.76
Rounded Total	524

PRIVATE	
T. 9 S., R. 40 E.,	
sec. 19, NE1/4 lot 4;	9.42
sec. 29, NW1/4;	160.00
sec. 30, N1/2NE1/4.	80.00
Total	249.42
Rounded Total	249
Tract Total	1370.52
Rounded Tract Total	1371

Attachment B

TRACT MAP
-Wolf Mountain-

Please see the tract map at the beginning of Part I.

COAL DETERMINATIONS
WOLF MOUNTAIN MAINTENANCE TRACT

Coal Quality

The coals of this tract have very high BTU content and a low percentage of sulfur as compared to other coals of the Powder River Basin. Therefore, a Class 1 rating is applied to this evaluation factor.

Transportation

An established rail line lies 2 miles east of the tract. A Class 1 rating was applied for this category.

Minability

The tract has two seams, separated by a relatively thin parting, over most of its area. A fault with a significant displacement cuts across the lower portion of the tract. A paved highway cuts across the tract in the same general area. The extent of the tract is constrained by an alluvial valley floor to the east, high overburden to the west, and wildlife habitat to the north. In consideration of the previous discussion, a Class 2 rating was applied for minability.

MINING ENGINEERING
DEFINITIONS AND ASSUMPTIONS
-Wolf Mountain Maintenance -

Deductions from the in-place resource were made for buffer zones and high-wall reduction zones. A recovery factor of 90 percent was then applied to the minable resource to determine the recoverable resource.

The rating for transportation was determined from the following table:

Rating	Distance to Established Transportation Link
Good	0-7 miles
Moderate	7-15 miles
Poor	15- miles

For a tract with more than one minable seam a weighted average proximate analysis was figured for the tract. The tract's proximate analysis was then compared to analyses from other marketed coals in the area for rating purposes.

References Cited

Baker, A. A., 1929, The northward extension of the Sheridan coal field, Big Horn and Rosebud Counties, Montana: U.S. Geological Survey Bulletin 806-B, part 2, p. 15-67.

Law, B. E., and Grazis, S. L., 1972, Preliminary geologic map and coal resources of the Decker quadrangle, Big Horn County, Montana: U.S. Geological Survey Open-File Report

Bureau of Land Management
Library
Bldg. 50, Denver Federal Center
Denver, CO 80225

Bureau of Land Management
Library
Bldg. 50, Denver Federal Center
Denver, CO 80225